selves. Even now I can see, beneath a broad Stetson, the contented smile stealing over Pearce's weather-beaten features while he surveys his far-flung prairies, and the kindly twinkle in his eye as he turns in his saddle to ask, "Have you ever seen a purtier country than this?" And I can still answer with conviction, "I never have."

Montgomery, Alabama.

THE DECLINE OF THE JACKSNIPE IN SOUTHERN WISCONSIN

BY ALDO LEOPOLD

The purpose of this paper is to present evidence of a recent decrease in jacksnipe or Wilson's Snipe (*Gallinago delicata*), to the end of stimulating action for the conservation of this bird and its habitat.

Its original abundance in the Mississippi Valley was probably beyond our present imaginative powers. Bogardus[1] (1874) killed 340 in a single day on the Salt Creek bottoms of the Sangamon River, and wagered to kill 100 straight in a day on this area. There were no takers. He says: "Our bag was seldom as small as seventy-five couple at the right time. . . . Snipe are vastly more abundant in the West . . . than in the East."

Kumlien and Hollister[2] (1903) say of the jacksnipe: "still common . . . [but] . . . we should be at a loss to express its numbers in former years." This refers especially to Walworth County, Wisconsin, where Kumlien began his observations about 1868.

Schorger[3] (1929) gives the jacksnipe as an abundant migrant in Dane County, but states that "a gradual decrease in numbers has taken place during the last fifteen years."

The extent of this recent decline may be roughly measured by means of the following table and chart, compiled from Schorger's ornithological notes for 1919-1929, and my shooting journal for 1924-1929.

The table reduces the number of jacksnipe seen and killed by each of us to yearly averages of the number "seen per trip" (Graph A) and the number "killed per hunt" (Graph B). The reason for distinguishing "trips" and "hunts" is that Schorger made many trips during

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[1]Field, Cover and Trap Shooting, A. H. Bogardus, J. B. Ford & Co., N. Y., 1874, p. 136.

[2]Birds of Wisconsin, L. Kumlien and N. Hollister, Bull. Wis. Natural Hist. Society, Nos. 1-3, April-July, Milwaukee, 1903.

[3]Birds of Dane County, Wis., A. W. Schorger, Trans. Wis. Acad. Science, Vol. XXIV, Nov., 1929.

which no hunting was done. In both cases trips and hunts varied from a quarter day to a full day in length, and all were made in or near Dane County.

My journal records the length of each hunt, so that I was able to reduce my figures to terms of jacksnipe seen and killed per full day (Graphs C and D). The table, for simplicity, omits these calculations, but the greater smoothness of graphs C and D, as compared with A and B, reflects the removal of the disturbance due to varying lengths of time in the field.

The downward trend of all four graphs is apparent at a glance. A median line, drawn by averaging coordinates in groups of three, has been added to Graph A in order to show its general trend, as distinguished from its temporary fluctuations. A downward trend is apparent in all the graphs except B, and is clear in this case when figures have been reduced to kill per full day on Graph D. The chart, therefore, indicates a progressive decrease in the abundance of jacksnipe in Dane County. Can this apparent local decrease be accepted as actual? If so, does it reflect a general decrease?

A downward trend in birds killed might reflect poorer shooting rather than fewer birds. That there was no significant deterioration in my own shooting is indicated by data in my journal on shells per bird in bag up to 1926. As for Schorger's shooting, my impression is that it has improved rather than deteriorated. Both of us have used the same guns and I used the same dog throughout the period covered. Even if there were no data on marksmanship, however, the downward trend of birds seen would still indicate a decrease. Moreover, the graphs make no allowance for increasing skill in where and how to seek birds. At the time our records begin I was new to the region, and Schorger had never hunted snipe systematically. That we have both learned something about their local habits is shown later on. In my judgment, even a horizontal trend in the various graphs would be reason for suspecting a decrease.

Another explanation of the downward trend of all graphs might be that local shortages in food and water caused the migrating birds to pass over or around this locality. In so far as known, jacksnipe food is a function of water. The water in the remaining snipe marshes of Dane County is comparatively stable, because the marshes either lie at the level of artificially stabilized lakes, or are spring-fed, or both. Late summer and fall rainfall makes some difference, even in spring-fed or lake-level marshes, but not nearly so much as in marshes fed entirely by river overflow or by rain. Rainfall figures for August

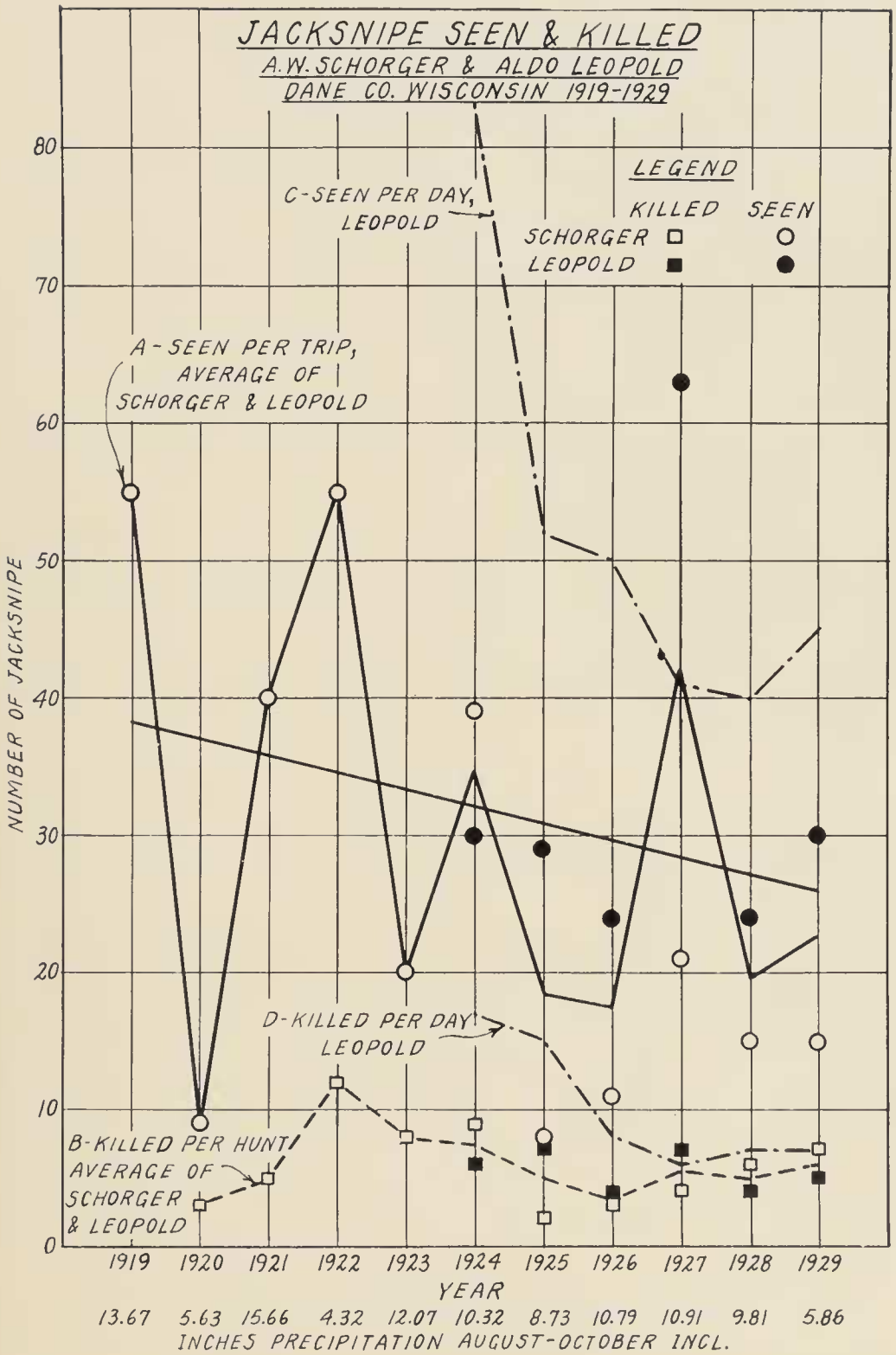

FIGURE 16. Graph showing diminution in number of Jacksnipes seen or killed from year to year during these studies.

to October of each year are entered at the bottom of the chart. I do not recall any year in which there was either a great shortage or a great surplus of snipe-water throughout an entire shooting season.

Insufficient grazing might have reduced the attractiveness of our local snipe grounds, and thus account for an apparent decrease in birds seen and killed. It is not likely to have affected these figures, however, because Dane County is in the heart of the Wisconsin dairy belt, in which both the number of cattle and the allocation of areas used as pasture are quite constant from year to year. Snipe ground must ordinarily be grazed in order to be good, apparently because ungrazed ground does not offer enough exposed mud. The muddy or boggy shorelines of receding ponds are used when available, especially early in the season, regardless of whether grazed or no, but this exception merely proves the rule.. Late November birds often resort to floating bogs covered with heavy ungrazed vegetation, but this is during cold weather. Apparently under such conditions the shelter-value of the vegetation offsets its obstruction of free access to the mud. Moreover, these floating bogs are then often the only ground left unfrozen. (These are all things Schorger and I have learned during the period covered by the graphs.. If the supply of birds had remained constant, this added knowledge should have produced a rising trend both in snipe seen and snipe killed).

Drainage might be another source of error. It is estimated that the available ground in Dane County has been shrinking at the rate of perhaps ten per cent per year by reason of new ditches. At this writing there are practically no large snipe grounds left except at lake-levels, where drainage can be effected only by pumping, and hence is seldom attempted. Numerous small upland potholes and springheads, however, still remain undrained. Ditched ground is usually worthless, even when wet by rains, and is avoided in hunting. Hence the only way for drainage to have invalidated these figures is by switching the migration route. I cannot appraise the probability of such a change, except to say that since there is still enough ground to hunt on, there would appear to be still enough to detain a normal density of migrating birds.

The actuality of the seeming decline in snipe is corroborated by the reports of local ornithologists on the spring migration, at which season the birds are not dependent on undrained marshes. For several years past the local bird-men, who each spring scour much country in search of other birds while the hunters are not afield, have been reporting a scarcity of snipe.

Jacksnipe Seen and Killed

A. W. Schorger and Aldo Leopold, Dane County, Wisconsin, 1919-1929.

Date	Schorger Seen	Schorger Killed
1919		
9-27	40	*x
10-11	50	x
10-26	75	x
	165	
Seen per Trip	55	
Killed per Hunt		x
1920		
7-24	7	x
8-1	6	x
8-8	3	x
9-18	8	x
9-25	25	3
11-25	4	x
	53	3
Seen per Trip	9	
Killed per Hunt		3
1921		
9-18	25	x
9-24	30	2
10-22	100	13
10-23	6	1
	161	16
Seen per Trip	40	
Killed per Hunt		5
1922		
8-13	8	x
8-20	6	x
9-24	20	x
10-7	200	12
10-12	80	13
11-5	15	x
	329	25
Seen per Trip	55	
Killed per Hunt		12

Date	Schorger Seen	Schorger Killed	Leopold Seen	Leopold Killed
1923				
7-28	2	x		
9-8	35	x		
9-29	25	9		
10-6	60	13		
10-21	1	x		
10-28	12	6		
11-10	5	2		
	140	30		
Seen per Trip	20			
Killed per Hunt		8		
1924				
9-28	3	1	4	2
9-30			15	3
10-1			3	1
10-2			15	2
10-4			15	4
10-7			6	2
10-12	50	x	30	7
10-14			50	9
10-18			50	14
10-19	75	20		
10-22			100	9
10-25	30	6		
10-26			20	6
10-28			60	9
11-4			40	11
11-9			7	6
	158	27	417	85
Seen per Trip	39		30	
Killed per Hunt		9		6

*The symbol x means no hunting done.

1925

Date	Schorger Seen	Schorger Killed	Leopold Seen	Leopold Killed
9-13	1	x		
9-26	4	x	30	11
9-27			20	4
10-10	1	1	40	10
10-11	9	0	50	14
10-17			50	11
10-18			25	2
10-22			50	12
10-24	20	2	25	8
10-25	2	0	10	1
10-31	8	1	50	9
11-1	20	5	25	10
11-7	12	7		
	77	16	315	92
Seen per Trip..	8		29	
Killed per Hunt		2		8

1926

8-28	5	x		
8-29	3	x		
9-19	14	x		
9-21	6	1		
9-25	7	1	20	7
9-26	9	x	12	3
10-2	15	4		
10-3			3	0
10-4			3	1
10-7			20	3
10-8	20	6		
10-9			35	5
10-10			2	0
10-15	7	1		
10-16	2	1	1	1
10-17	30	5	30	6
10-23			100	11
10-30			30	6
	118	22	256	43
Seen per Trip..	11		24	
Killed per Hunt		3		4

1927

Date	Schorger Seen	Schorger Killed	Leopold Seen	Leopold Killed
8-13	24	x		
8-27	15	x		
9-10	17	x		
9-16			?	6
9-23	16	x	15	6
9-24	30	5		
10-1	9	1		
10-8	40	5		
10-15	15	4	100	10
10-22			75	5
	166	15	190	27
Seen per Trip..	21		63	
Killed per Hunt		4		7

1928

9-22	2	x	1	1
9-23	12	x		
9-29	9	x	30	4
10-2			50	9
10-6	25	11		
10-13	30	5		
10-14			40	6
10-20	12	5		
10-27	12	2		
11-11			1	1
	102	23	122	21
Seen per Trip..	15		24	
Killed per Hunt		6		4

1929

9-14	3	x		
9-19	30	7		
9-21	20	6		
10-4	30	15		
10-8			20	7
10-12	7	x		
10-13			40	4
10-15	20	6		
10-19	30	11		
10-20	11	x		
11-3	30	5		
11-9	6	x		
11-16	2	0		
	162	50	60	11
Seen per Trip..	15		30	
Killed per Hunt		7		5

All of the foregoing evidence pertains to Dane County and its immediate environs. In order to get a rough check on conditions elsewhere in the state, twelve selected jacksnipe hunters, all from different counties, were asked for their opinion on recent trends. Of these, five reported no perceptible change in recent years, six reported a decline, and one reported that recent flights have been more sporadic than formerly.

Taking everything together it is my conclusion: (1) that the jacksnipe in the region of Dane County, Wisconsin, has decreased perhaps fifty per cent since 1924; (2) that this may be due to their passing over or around us, or to a temporary abundance cycle, or to an actual decrease in the available supply; (3) that the only reason for doubting an actual decrease in the available supply would be positive evidence that they have increased or held their own in the rest of the Mississippi Valley.

If there is any such evidence of increase, I have not seen or heard of it. Such slight evidence as I have for the remainder of Wisconsin indicates that the decrease here indicated for Dane County has been statewide.

The possible causes of the decrease are a matter of conjecture. One likely cause is the shrinkage in southern breeding ranges, which were possibly the most productive. Bogardus[1] says that jacksnipe formerly bred as far south as the Calumet River and the great Winnebago swamp in Illinois, whereas Schorger[3] is in doubt whether they still breed in Dane County. The twelve snipe hunters whom I questioned concerning the status of jacksnipe elsewhere in Wisconsin reported their breeding in Sheboygan, Winnebago, Rusk, and Sawyer Counties. The most southerly of these is Sheboygan. From this, their present known southerly limit, to the Calumet River in Illinois, their probable southerly limit in 1874, is 120 miles.

The only really comprehensive check against the further shrinkage of marshes would be to accord undrained marshes a special tax status in view of their public service to migratory birds, just as ungrazed farm woodlots and managed forests are beginning to be accorded a special tax status in view of their public value to watersheds and timber supply.

Overshooting of jacksnipe doubtless occurs, but not so far in southern Wisconsin. The majority of hunters pay no attention to them as yet, but the number who do so is rapidly increasing.

As nearly as I am aware, the diseases, parasites, and predatory enemies of the jacksnipe are unknown, and their food nearly so. An

adequate life-history study would seem to be one of the obvious first moves toward a conservation program.

NOTE: Since preparing this manuscript I obtained from Mr. D. H. Haines of Ann Arbor, Michigan, through the kind offices of his shooting companion, Prof. Kenneth McMurray of the University of Michigan, a digest of the former's Shooting Journal by days. This is summarized by years as follows:

JACKSNIPE KILLED IN MICHIGAN
BY DONALD H. HAINES

Year	Place	No. Killed	No. Hunts
1918	Kalamazoo	68	21
1919	Kalamazoo	47	26
1920	(Absent from State)		
1921	Ann Arbor	14	11
1922	Ann Arbor	7	13
1923	Ann Arbor	15	14
1924	Ann Arbor	31	23
1925	Ann Arbor	0	15
1926	Ann Arbor	1	10
1927	Ann Arbor	9	11
1928	Ann Arbor	18	18
1929	Ann Arbor	90	18
Total		300	180
Average		27	16

Mr. Haines' bag of snipe was obtained in conjunction with and sometimes incidental to a good deal of marsh duck hunting, hence his figures are not so direct an index to abundance as Schorger's or my own. For this reason they were not added to the graph. Nevertheless he assures me that whenever snipe were present in any numbers he usually hunted them. With respect to frequency, length, and regularity of hunts, his practice resembles Schorger's and mine.

Mr. Haines' Ann Arbor bag was above average in 1924 and 1929. (The exceptionally high 1929 figure was coincident with leasing some favorable marsh and hunting it oftener than usual). Our graphs show high in 1922 and 1924, and indicate an improvement in 1929.

Mr. Haines' bag was low in 1922, 1925, 1926, and 1927. Our graphs show low in 1920, 1923, 1925, 1926, possible 1927, and 1928.

The comparison is contradictory in only one year, 1922, and shows enough correspondence to suggest that Michigan and Wisconsin may both feel the same fluctuations in abundance.

GAME SURVEY,
MADISON, WIS.